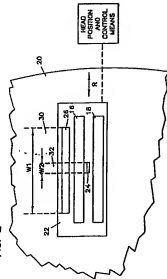


US 2004/014925 Claim 35	US 6,104,556 Specification
<p>A method of verifying data areas of tracks of a storage medium using a write element and a read element, the method comprising:</p>	<p>(1) As noted above, the present invention relates generally to a recording media certification process, apparatus and article of manufacture and, in preferred embodiments, to such a process, apparatus and article for testing magnetic recording discs, using a wide write head and, preferably, for use with a skip track testing procedure. Preferred embodiments of the present invention are described herein, primarily with reference to a hard disk drive apparatus and magnetic recording tracks. It is understood that further embodiments are applicable to other types of recording media having one or more tracks. The present invention also includes a computer program product for testing recording apparatus, process and article or articles with a magnetic hard disk recording media, such as that 20 shown in FIG. 2. In the FIG. 2 embodiment, an MR read/write head, generally shown at 22, has a read element 24 and a write element 26. (col. 5 lines 32-37)</p>
<p>(A) positioning the write element over a track on the storage medium;</p>	<p>(1) However, unlike the head shown in FIG. 1, the write element 26 of the head 22 has a width dimension which defines a write (or test) track width that encompasses plural read element ring tracks, or read tracks. (col. 6 lines 37-40). (2) Once appropriate read element and write element widths are selected and a head having such read and write elements is positioned and supported adjacent a disc recording surface, a process for testing a disc preferably proceeds as follows. (col. 6 lines 33-37)</p>
<p>(B) writing a certification pattern to a data area of said track with the write element;</p>	<p>(1) In this regard, magnetic recording discs which are used in magnetic disc drives are typically screened, or tested for magnetic defects during or after manufacture. Generally, such certification processes involve electromagnetically writing a signal on the disc and then reading the recorded magnetic signal back. (col. 1 lines 22-27) ... (2) In one disc revolution, a wide write track is recorded by the write element. (col. 6 lines 37-38)</p>
<p>(C) repositioning the write element to be positioned at least partially over another track on the storage medium;</p>	<p>(1) The head is then stepped to position the read element to define a further read track within the wide write track, for example, directly adjacent the read track defined in the previous step. (col. 6 lines 42-45). (2) In such preferred embodiments in which read element is offset relative to the write element, the test process may be further simplified in that, as the head is stepped to incrementally step the read element across the pre-written write track (e.g., steps 2-4 in the above processes), the write element is also stepped toward the next write track position (provided the read and write elements are disposed within the same head). (col. 8 lines 25-32)</p>
<p>(D) while the write element is positioned at least partially over a portion of said certification pattern using the read element in order to allow the integrity of said data area to be checked, and</p>	<p>(1) The signal recorded on that further read track is read back, preferably in the next revolution of the disc. (col. 6 lines 45-48) ... (2) The signal read during the reading steps are stored, for example, according to well known digital analysis techniques, and the results are analyzed to determine if the recorded signal is within a predetermined threshold value. If the amplitude of the read signal is below the threshold value, then a record is made of the location of the reading track (or reading track portion) at which the below-threshold signal was read. (col. 7 lines 48-55)</p>
<p>(E) repeating steps (A) to (D) as required for subsequent tracks on the storage medium.</p>	<ol style="list-style-type: none"> <li>1. Write a wide track.</li> <li>2. Read the written track.</li> <li>3. Step to the next track location.</li> <li>4. Read the track.</li> <li>5. Repeat steps 3 and 4 a total of N-2 additional times.</li> <li>6. Step to the next track (with or without skipping track widths).</li> <li>7. Repeat the sequence. (col. 7 lines 1-9)</li> </ol>

FIG. 2



<p>US 2004/0148925 Claim 37</p> <p>Apparatus for verifying data areas of tracks of a storage medium, the apparatus comprising:</p>	<p>US 5,104,556 Specification</p> <p>As noted above, the present invention relates generally to a recording media certification process, apparatus and article of manufacture and, in preferred embodiments, to such a process, apparatus and article for testing magnetic recording discs, using a wide write head and, preferably, for use with a skip track procedure. Preferred embodiments of the present invention are described herein, primarily with reference to a hard disk drive apparatus and magnetic hard disk recording media. However, it will be understood that further embodiments are applicable to other types of recording media having one or more recording tracks.... (col. 5 lines 10-20)</p>
<p>a write element and a read element that are offset from each other, the write element having a width that is greater than the pitch of the tracks on a said storage medium;</p>	<p>According to one preferred embodiment, an improved skip track testing apparatus, process and article operates with a magnetic hard disc recording media, such as disc 20 shown in FIG. 2. In the FIG. 2 embodiment, an MR read/write head, generally shown at 22, has a read element 24 and a write element 26. However, unlike the head shown in FIG. 1, the write element 26 of the head 22 has a write dimension which defines a write (or test) track width that encompasses plural read element ring tracks, or read tracks. That is, the width of the write element (in the radial dimension of the disc) may be defined in relation to the width of the read element (in the radial dimension of the disc), as being at least twice as wide as the read element width, so as to define a write track which is at least two read track widths (in the radial dimension of the disc). As discussed in more detail below, by virtue of this increased write-element-width-to-read element-width ratio, it is possible to write multiple tracks at one time, to improve testing efficiency, for example, in a skip track testing process or the like. (col. 5 lines 32-41)</p>
<p>the apparatus being arranged such that the write element can be positioned over a track on the storage medium;</p>	<p>Once appropriate read element and write element widths are selected and a head having such read and write elements is positioned and supported adjacent a disc recording surface, a process for testing a disc preferably proceeds as follows. (col. 6 lines 33-37)</p>
<p>such that a certification pattern is written to a data area of said track with the write element;</p>	<p>(1) In this regard, magnetic recording discs which are used in magnetic disc drives are typically screened, or tested for magnetic defects during or after manufacture. Generally, such certification processes involve electromagnetically writing a signal on the disc and then reading the recorded magnetic signal back. (col. 1 lines 22-27) ... (2) In one disc revolution, a wide write track is recorded by the write element. (col. 6 lines 37-38)</p>
<p>and such that the write element can be repositioned to be at least partially over another track on the storage medium and such that, while the write element is positioned at least partially over said another track on the storage medium, at least a portion of said certification pattern is read using the read element</p>	<p>(1) The head is then stepped to position the read element to define a further read track within the wide write track, for example, directly adjacent the read track defined in the previous step. The signal recorded on that further read track is read back, preferably in the next revolution of the disc. (col. 6 lines 42-46). (2) In such preferred embodiments in which read element is offset relative to the write element, the test process may be further simplified in that, as the head is stepped to incrementally step the read element across the pre-written write track (e.g., steps 2-4 in the above processes), the write element is also stepped toward the next write track position (provided the read and write elements are disposed within the same head). (col. 8 lines 25-32)</p>
<p>in order to allow the integrity of said data area to be checked.</p>	<p>The signals read during the reading steps are analyzed, for example, according to well known testing analysis techniques. In one preferred embodiment, the analysis involves comparing the amplitude of the read signal with a predetermined amplitude threshold value and, if the amplitude of the read signal is below the threshold value, then a record is made of the location of the reading track (or reading track portion) at which the below-threshold signal was read. (col. 7 lines 48-55)</p>

FIG. 2

